4.3.4.1.9 *Public and Occupational Health and Safety*

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with the vitrification facility. The section first describes the impacts from normal facility operation at each potential site followed by a description of impacts from facility accidents.

Summaries of the radiological impacts to the public and to workers associated with normal operation during the assumed 10-year campaign time are presented in Tables 4.3.4.1.9–1 and 4.3.4.1.9–2, respectively, are presented in the text. Impacts from hazardous chemicals to these same groups are given in Table 4.3.4.1.9–3. Summaries of impacts associated with postulated accidents are given in Table 4.3.4.1.9–4 through 4.3.4.1.9–9. Detailed results are presented in Section M. For the Preferred Alternative, the duration would be reduced to 3.5 years and the risk and fatalities would also be reduced proportionally. The vitrification facility would be collocated with the Pu conversion facility under the Preferred Alternative but are analyzed separately in this PEIS.

The DOE's Preferred Alternative for Pu disposition includes the use of vitrification or immobilization technologies for the disposition of Pu in existing reactors. As a result of implementing a multiple technology disposition strategy for analysis purposes, approximately 30 percent of the surplus Pu would be vitrified or immobilized. Summaries of the radiological and hazardous chemical impacts to the public and to workers associated with normal operations and with postulated accidents are presented for an assumed 10-year operational campaign for the disposition of 50 t (55.1 tons) of Pu and for an assumed 3.5-year operational campaign for the Preferred Alternative. The impacts and risks associated with the Preferred Alternative would be reduced due to a shorter period of operations. It should also be noted that a Pu conversion facility may be collocated with the vitrification or immobilized facility. Impacts attributed to the Pu conversion facility are described in Section 4.3.2.9 for 10 years of operation.

Normal Operation. There would be no radiological releases associated with the construction of a vitrification facility at any of the sites analyzed. Construction worker exposures to material potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of construction activities. If existing facilities are used, the hazardous chemical releases would be reduced. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct in-plant exposures. The resulting doses and potential health effects to the public and workers at each site are described below.

Radiological Impacts. Radiological impacts to the average and maximally exposed members of the public resulting from the normal operation of the vitrification facility at each of the sites are presented in Table 4.3.4.1.9–1. The impacts from all site operations, including the vitrification facility, are also given. To put operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

The doses to the maximally exposed member of the public from annual vitrification facility operation range from 7.2×10^{-6} mrem at the NTS site to 2.5×10^{-4} mrem at the ORR site. From 10 years of operation, the corresponding risks of fatal cancer to this individual would range from 3.6×10^{-11} to 1.3×10^{-9}. The impacts to the average individual would be less. As a result of annual operations, the population doses would range from 1.4×10^{-5} person-rem at the NTS site to 5.0×10^{-3} person-rem at the SRS site. The corresponding numbers of fatal cancers in these populations from 10 years of operation would range from 7.0×10^{-8} to 2.5×10^{-5}.

The dose to the maximally exposed member of the public from annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would range

Table 4.3.4.1.9–1. Potential Radiological Impacts to the Public During Normal Operation of the Vitrification Alternative

Receptor	Hanford		NTS		INEL		Pantex		ORR		SRS	
	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]
Annual Dose to the Maximally Exposed Individual Member of the Public [b]												
Atmospheric release pathway (mrem)	$1.4x10^{-5}$	$4.4x10^{-3}$	$7.2x10^{-6}$	$4.2x10^{-3}$	$8.9x10^{-6}$	0.018	$1.1x10^{-4}$	$1.3x10^{-4}$	$2.5x10^{-4}$	1.5	$7.7x10^{-5}$	0.42
Drinking water pathway (mrem)	0	0	0	0	0	0	0	0	0	0.10	0	0.081
Total liquid release pathway (mrem)	0	$9.5x10^{-4}$	0	0	0	0	0	0	0	1.7	0	0.37
Atmospheric and liquid release pathways combined (mrem)	$1.4x10^{-5}$	$5.3x10^{-3}$	$7.2x10^{-6}$	$4.2x10^{-3}$	$8.9x10^{-6}$	0.018	$1.1x10^{-4}$	$1.3x10^{-4}$	$2.5x10^{-4}$	3.2	$7.7x10^{-5}$	0.79
Percent of natural background[c]	$4.7x10^{-6}$	$1.8x10^{-3}$	$2.3x10^{-6}$	$1.3x10^{-3}$	$2.6x10^{-6}$	$5.2x10^{-3}$	$3.3x10^{-5}$	$3.9x10^{-5}$	$8.5x10^{-5}$	1.1	$2.6x10^{-5}$	0.27
10-year fatal cancer risk	$7.0x10^{-11}$	$2.7x10^{-8}$	$3.6x10^{-11}$	$2.1x10^{-8}$	$4.5x10^{-11}$	$8.8x10^{-8}$	$5.5x10^{-10}$	$6.4x10^{-10}$	$1.3x10^{-9}$	$1.6x10^{-5}$	$3.9 x10^{-10}$	$4.0x10^{-6}$
3.5-year fatal cancer risk[d]	$2.5x10^{-11}$	$9.5x10^{-9}$	$1.3x10^{-11}$	$7.4x10^{-9}$	$1.6x10^{-11}$	$3.1x10^{-8}$	$1.9x10^{-10}$	$2.2x10^{-10}$	$4.6x10^{-10}$	$5.6x10^{-6}$	$1.4x10^{-10}$	$1.4x10^{-6}$
Annual Population Dose Within 80 Kilometers [e]												
Atmospheric release pathway (person-rem)	$7.9x10^{-4}$	0.46	$1.4x10^{-5}$	$3.7x10^{-3}$	$1.6x10^{-4}$	2.4	$3.4x10^{-4}$	$6.2x10^{-4}$	$4.4x10^{-3}$	29	$5.0x10^{-3}$	40
Total liquid release pathway (person-rem)	0	1.1	0	0	0	0	0	0	0	4.7	0	3.6
Atmospheric and liquid release pathways combined (person-rem)	$7.9x10^{-4}$	1.6	$1.4x10^{-5}$	$3.7x10^{-3}$	$1.6x10^{-4}$	2.4	$3.4x10^{-4}$	$6.2x10^{-4}$	$4.4x10^{-3}$	34	$5.0x10^{-3}$	44
Percent of natural background[c]	$4.2x10^{-7}$	$8.4x10^{-4}$	$1.5x10^{-7}$	$4.1x10^{-5}$	$1.8x10^{-7}$	$2.7x10^{-3}$	$2.9x10^{-7}$	$5.3x10^{-7}$	$1.2x10^{-6}$	$9.0x10^{-3}$	$1.9x10^{-6}$	0.017
10-year fatal cancers	$4.0x10^{-6}$	$7.8x10^{-3}$	$7.0x10^{-8}$	$1.9x10^{-5}$	$8.0x10^{-7}$	0.012	$1.7x10^{-6}$	$3.1x10^{-6}$	$2.2x10^{-5}$	0.17	$2.5x10^{-5}$	0.22
3.5-year fatal cancers[d]	$1.4x10^{-6}$	$2.7x10^{-3}$	$2.5x10^{-8}$	$6.7x10^{-6}$	$2.8x10^{-7}$	$4.2x10^{-3}$	$6.0x10^{-7}$	$1.1x10^{-6}$	$7.7x10^{-6}$	0.060	$8.8x10^{-6}$	0.077

Table 4.3.4.1.9–1. Potential Radiological Impacts to the Public During Normal Operation of the Vitrification Alternative—Continued

Receptor	Hanford		NTS		INEL		Pantex		ORR		SRS	
	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]
Annual Dose to the Average Individual Within 80 Kilometers[f]												
Atmospheric and liquid release pathways combined (mrem)	$1.3x10^{-6}$	$2.6x10^{-3}$	$4.8x10^{-7}$	$1.3x10^{-4}$	$5.9x10^{-7}$	$8.9x10^{-3}$	$9.7x10^{-7}$	$1.8x10^{-6}$	$3.4x10^{-6}$	0.026	$5.6x10^{-6}$	0.049
10-year fatal cancer risk	$6.4x10^{-12}$	$1.3x10^{-8}$	$2.4x10^{-12}$	$6.3x10^{-10}$	$3.0x10^{-12}$	$4.5x10^{-8}$	$4.9x10^{-12}$	$8.9x10^{-12}$	$1.7x10^{-11}$	$1.3x10^{-7}$	$2.8x10^{-11}$	$2.5x10^{-7}$
3.5-year fatal cancer risk[d]	$2.2x10^{-12}$	$4.6x10^{-9}$	$8.4x10^{-13}$	$2.2x10^{-10}$	$1.1x10^{-12}$	$1.6x10^{-8}$	$1.7x10^{-12}$	$3.1x10^{-12}$	$6.0x10^{-12}$	$4.6x10^{-8}$	$9.8x10^{-12}$	$8.8x10^{-8}$

[a] Includes impacts from No Action facilities (refer to Sections 4.2.1.9 through 4.2.6.9). The location of the maximally exposed individual may be different under No Action than for operation of the vitrification facility.Therefore, the impacts may not be directly additive.

[b] The applicable radiological limits for an individual member of the public from site operations are 10 mrem per year from the air pathways, as required by the NESHAPs (40 CFR 61, Subpart H) under the CAA; 4 mrem per year from the drinking water pathway, as required by the SDWA; and 100 mrem per year from all pathways combined. Refer to DOE Order 5400.5.

[c] The annual natural background radiation levels: (1) Hanford: the average individual receives 300 mrem; the population within 80 km receives 186,400 person-rem, (2) NTS: the average individual receives 313 mrem; the population within 80 km receives 9,190 person-rem, (3) INEL: the average individual receives 338 mrem; the population within 80 km receives 90,800 person-rem, (4) Pantex: the average individual receives 334 mrem; the population within 80 km receives 116,900 person-rem, (5) ORR: the average individual receives 295 mrem; the population within 80 km receives 379,000 person-rem, (6) SRS: the average individual receives 298 mrem; the population within 80 km receives 266,000 person-rem.

[d] For the Preferred Alternative for analysis purposes approximately 30 percent of Pu was assumed for vitrification or immobilization technologies, the operational campaign would decrease. As a result, the impacts projected for 50 t for the assumed 10-year campaign would be proportionally reduced to a 3.5-year campaign.

[e] For DOE activities proposed 10 CFR 834 (see 58 FR 16268) would generally limit the potential annual population dose to 100 person-rem from all pathways combined, and would require an ALARA program.

[Text deleted.]

[f] Obtained by dividing the population dose by the number of people projected to be living within 80 km of the site (621,000 at Hanford, 29,400 at NTS, 269,000 at INEL, 350,000 at Pantex, 1,285,000 at ORR, and 893,000 at SRS.)

Source: Section M.2.

from $1.3x10^{-4}$ mrem at Pantex to 3.2 mrem at the ORR site. From 10 years of operation, the corresponding risk of fatal cancer to this individual would range from $6.4x10^{-10}$ to $1.6x10^{-5}$. The impacts to the average individual would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of annual total site operations, the population doses would be within the limit in proposed 10 CFR 834, and would range from $6.2x10^{-4}$ person-rem at Pantex to 44 person-rem at the SRS site. The corresponding number of fatal cancers in these populations from 10 years of operation would be range from $3.1x10^{-6}$ to 0.22. The disposition of approximately 30 percent of Pu using vitrification or immobilization technologies would decrease the operational campaign length. As a result, the impacts projected in this table for 50 t (55.1 tons) for the assumed 10-year campaign would be proportionately reduced.

Doses to onsite workers from normal operations are given in Table 4.3.4.1.9–2. Included are involved workers directly associated with the vitrification facility, workers who are not involved with the vitrification facility, and the entire workforce at each site. All doses fall within regulatory limits.

The annual dose to vitrification facility workers is site-independent and would be 200 mrem to the average facility worker and 110 person-rem to the entire facility workforce. The annual dose to the noninvolved worker would range from 2.6 mrem at the ORR site to 32 mrem at the SRS site. The annual total dose to all noninvolved workers would range from 3.0 person-rem at the NTS site to 250 person-rem at Hanford. The annual dose to the total site workforce would range from 113-person-rem at the NTS site to 360 person-rem at the Hanford site. The risks and numbers of fatal cancer among the different workers from 10 years of operation are included in Table 4.3.4.1.9–2. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also worker rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of this facility.

Hazardous Chemical Impacts. The hazardous chemical impacts to the public resulting from normal operation of the vitrification facility at each of several sites are presented in Table 4.3.4.1.9–3. Included is the impact due only to operation of the vitrification facility and the site's total hazardous chemical impact. The total site impacts are provided to demonstrate the estimated level of health effects expected and the risk of cancer due to the total chemical exposures on each site. All supporting impact analyses are provided in Section M.3.

The HI to the MEI ranges from $1.0x10^{-4}$ at the NTS site to $3.9x10^{-3}$ at the ORR site due to the new facility operation. The cancer risk from hazardous chemicals to the MEI is zero (because no carcinogens are released from hazardous chemicals) at all sites. The HI to the onsite worker ranges from 0.019 at the Pantex site to 0.040 at ORR, and the cancer risk to the onsite worker is zero (because no carcinogens are released from hazardous chemicals) at all sites. [Text deleted.]

Facility Accidents. A set of potential accidents has been postulated for the vitrification facility, where releases of Pu may occur that may impact onsite workers and the offsite population. The accident consequences and risks to a worker located 1,000 m (3,280 ft) from the accident release point, the maximum offsite individual located at the site boundary, and general population located within 80 km (50 mi) of the accident release point are summarized in Table 4.3.4.1.9–4 through 4.3.4.1.9–9 for the sites analyzed (Hanford, NTS, INEL, Pantex, ORR, and SRS). In the event that the site boundary is less than 1,000 m from the accident release point, the worker is placed at the site boundary. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be $9.9x10^{-3}$ at ORR for the Cs fire accident scenario with a probability of $1.0x10^{-6}$ per year. The corresponding 10 year cancer facility lifetime risk from the same accident scenarios for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be $9.9x10^{-8}$, $7.7x10^{-11}$ and $3.8x10^{-10}$, respectively. The maximum population 10-year facility lifetime risk would be $1.8x10^{-5}$ (that is, one fatality in over 600,000 years) at ORR for the Cs ion processing fire accident scenario with a probability of $1.0x10^{-6}$ per year. The corresponding maximum offsite individual and worker 10 year facility lifetime risks would be $1.4x10^{-8}$ and $6.8x10^{-8}$, respectively. The disposition of approximately 30 percent of Pu using vitrification or immobilization technologies would decrease the operational campaign length. As a result, the impacts projected for 50 t (55.1 tons) for the assumed 10-year campaign would be proportionally reduced.

Table 4.3.4.1.9–2. Potential Radiological Impacts to Workers During Normal Operation of the Vitrification Alternative

Receptor	Hanford	NTS	INEL	Pantex	ORR	SRS
Involved Workforce[a]						
Average worker dose (mrem/yr)[b]	200	200	200	200	200	200
10-year risk of fatal cancer	8.0×10^{-4}	8.0×10^{-4}	8.0×10^{-4}	8.0×10^{-4}	8.0×10^{-4}	8.0×10^{-4}
3.5-year risk of fatal cancer[c]	2.8×10^{-4}	2.8×10^{-4}	2.8×10^{-4}	2.8×10^{-4}	2.8×10^{-4}	2.8×10^{-4}
Total dose (person-rem/yr)	110	110	110	110	110	110
10-year fatal cancers	0.44	0.44	0.44	0.44	0.44	0.44
3.5-year risk of fatal cancer[c]	0.15	0.15	0.15	0.15	0.15	0.15
Noninvolved Workforce[d]						
Average worker dose (mrem/yr)[b]	27	5.0	30	10	2.6	32
10-year risk of fatal cancer	1.1×10^{-4}	2.0×10^{-5}	1.2×10^{-4}	4.0×10^{-5}	1.0×10^{-5}	1.3×10^{-4}
3.5-year risk of fatal cancer[c]	3.9×10^{-5}	7.0×10^{-6}	4.2×10^{-5}	1.4×10^{-5}	3.5×10^{-6}	4.6×10^{-5}
Total dose (person-rem/yr)	250	3.0	220	14	44	226
10-year fatal cancers	1.0	0.012	0.88	0.056	0.18	0.90
3.5 year fatal cancers[c]	0.35	4.2×10^{-3}	0.31	0.020	0.063	0.32
Total Site Workforce[e]						
Dose (person-rem/yr)	360	113	330	124	154	336
10-year fatal cancers	1.4	0.45	1.3	0.50	0.62	1.3
3.5 year fatal cancers[c]	0.49	0.16	0.46	0.18	0.22	0.46

[a] The involved worker is associated with operations of the vitrification facility.

[b] The radiological limit for an individual worker is 5,000 mrem/year (10 CFR 835). However, DOE has also established an administrative control level of 2,000 mrem per year (DOE 1992t); the sites must make reasonable attempts to maintain worker doses below this level.

[c] For the Preferred Alternative for analysis purposes approximately 30 percent of Pu was assumed for vitrification or immobilization technologies, the operational campaign would decrease. As a result, the impacts projected in this table for 50 t for the assumed 10-year campaign would be proportionally reduced to a 3.5-year campaign.

[d] The noninvolved worker is onsite but not associated with operations of the vitrification facility. The Noninvolved Workforce is equivalent to the No Action workforce.

[e] The impact to the total site workforce is the summation of the involved worker impact and the noninvolved worker impact.

[Text deleted.]

Source: Section M.2.

Table 4.3.4.1.9–3. Potential Hazardous Chemical Impacts to the Public and Workers During Normal Operation of the Vitrification Alternative

	Hanford		NTS		INEL		Pantex		ORR		SRS	
Receptor	**Facility[a]**	**Total Site[b]**	**Facility[a]**	**Total Site[b]**	**Facility[a]**	**Total Site[b]**	**Facility[b]**	**Total Site[c]**	**Facility[a]**	**Total Site[b]**	**Facility[a]**	**Total Site[b]**
Maximally Exposed Individual (Public)												
Hazard Index[c]	6.7×10^{-4}	7.3×10^{-4}	1.0×10^{-4}	1.0×10^{-4}	1.4×10^{-3}	0.017	3.7×10^{-3}	9.4×10^{-3}	3.9×10^{-3}	0.043	1.8×10^{-4}	5.3×10^{-3}
Cancer Risk[d]	0	0	0	0	0	3.6×10^{-6}	0	1.1×10^{-8}	0	0	0	1.3×10^{-7}
Worker Onsite												
Hazard Index[e]	0.038	0.042	0.020	0.020	0.038	0.26	0.019	0.025	0.040	0.19	0.034	1.2
Cancer Risk[f]	0	0	0	0	0	7.7×10^{-4}	0	4.5×10^{-7}	0	0	0	1.9×10^{-4}

[a] Facility=Contribution from the proposed new facility operation only.
[b] Total=Includes the contributions from the No Action and the proposed new facility operation.
[c] Hazard Index for MEI=sum of individual Hazard Quotients (noncancer health effects) for MEI.
[d] Cancer Risk for MEI=(Emissions concentration) x (0.286 [converts concentrations to doses]) x (Slope Factor).
[e] Hazard Index for workers=sum of individual Hazard Quotients (noncancer health effects) for workers.
[f] Cancer Risk for workers=(emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (Slope Factor).
Where there are no known carcinogens among chemicals emitted, there are no Slope Factors, therefore the calculated cancer risk value is 0.
Source: Section M.3, Tables M.3.4–48 through M.3.4–53.

Table 4.3.4.1.9–4. Vitrification Alternative Accident Impacts at Hanford Site

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatalities[b]**	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
Blender spill	9.1×10^{-10} (3.2×10^{-10})	1.8×10^{-9}	8.6×10^{-12} (3.0×10^{-12})	1.7×10^{-11}	7.6×10^{-8} (2.7×10^{-8})	1.5×10^{-7}	0.05
Melter spill	9.1×10^{-13} (3.2×10^{-13})	9.1×10^{-10}	8.6×10^{-15} (3.0×10^{-15})	8.6×10^{-13}	7.6×10^{-11} (2.7×10^{-11})	7.6×10^{-9}	1.0×10^{-3}
Cs capsule drop	5.3×10^{-12} (1.8×10^{-12})	5.3×10^{-11}	4.0×10^{-14} (1.4×10^{-14})	4.0×10^{-12}	6.4×10^{-10} (2.2×10^{-10})	6.4×10^{-8}	1.0×10^{-3}
Canister drop	9.0×10^{-12} (3.1×10^{-12})	9.0×10^{-10}	8.5×10^{-14} (3.0×10^{-14})	8.5×10^{-12}	7.5×10^{-10} (2.6×10^{-10})	7.5×10^{-8}	1.0×10^{-3}
CPC ion column fire	6.9×10^{-8} (2.4×10^{-8})	6.9×10^{-6}	5.3×10^{-10} (1.9×10^{-10})	5.3×10^{-8}	8.4×10^{-6} (2.9×10^{-6})	8.4×10^{-4}	1.0×10^{-3}
Pu oxide oven solids fire	1.7×10^{-14} (5.9×10^{-15})	1.7×10^{-12}	1.7×10^{-16} (6.0×10^{-17})	1.7×10^{-14}	1.2×10^{-13} (4.2×10^{-11})	1.2×10^{-10}	1.0×10^{-3}
Earthquake	4.4×10^{-12} (1.5×10^{-12})	4.4×10^{-8}	4.4×10^{-14} (1.5×10^{-14})	4.4×10^{-10}	3.2×10^{-10} (1.1×10^{-10})	3.2×10^{-6}	1.0×10^{-5} 1.0×10^{-5}
Cs fire	3.9×10^{-10} (1.4×10^{-10})	3.9×10^{-5}	3.0×10^{-12} (1.0×10^{-12})	3.0×10^{-7}	4.7×10^{-8} (1.6×10^{-8})	4.7×10^{-3}	1.0×10^{-6} 1.0×10^{-6}
Blender fire	7.0×10^{-11} (2.5×10^{-11})	7.0×10^{-6}	5.3×10^{-13} (1.9×10^{-13})	5.3×10^{-8}	8.4×10^{-9} (2.9×10^{-9})	8.4×10^{-4}	1.0×10^{-6} 1.0×10^{-6}
Nuclear criticality in Pu oxide furnace	4.2×10^{-12} (1.5×10^{-12})	4.2×10^{-7}	3.3×10^{-14} (1.2×10^{-14})	3.3×10^{-9}	3.5×10^{-11} (1.2×10^{-11})	3.5×10^{-6}	1.0×10^{-6}
Expected risk[d]	7.1×10^{-8} (2.5×10^{-8})	– –	5.4×10^{-10} (1.9×10^{-10})	– –	8.5×10^{-6} (3.0×10^{-6})	– –	– –

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values. For the Preferred Alternative for analysis purposes approximately 30 percent of Pu was assumed for vitrification or immobilization technologies and the operational campaign would decrease. As a result, the impacts projected in this table for 50 t for the assumed 10-year campaign would be proportionately reduced for a 3.5-year campaign.

Source: Calculated using the source terms in Tables M.5.3.5.1–3 and M.5.3.5.1–4 and the MACCS computer code.

Table 4.3.4.1.9–5. Vitrification Alternative Accident Impacts at Nevada Test Site

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatalities[b]**	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
Blender spill	6.2×10^{-10} (2.2×10^{-10})	1.2×10^{-9}	1.4×10^{-11} (4.9×10^{-12})	2.7×10^{-11}	1.7×10^{-9} (5.9×10^{-10})	3.5×10^{-9}	0.05
Melter spill	6.2×10^{-13} (2.2×10^{-13})	6.2×10^{-11}	1.4×10^{-14} (4.9×10^{-15})	1.4×10^{-12}	1.7×10^{-12} (5.9×10^{-13})	1.7×10^{-10}	1.0×10^{-3}
Cs capsule drop	3.6×10^{-12} (1.3×10^{-12})	3.6×10^{-10}	6.6×10^{-14} (2.3×10^{-14})	6.6×10^{-12}	1.5×10^{-11} (5.2×10^{-12})	1.5×10^{-9}	1.0×10^{-3}
Canister drop	6.1×10^{-12} (2.1×10^{-12})	6.1×10^{-10}	1.4×10^{-13} (4.9×10^{-14})	1.4×10^{-11}	1.7×10^{-11} (5.9×10^{-12})	1.7×10^{-9}	1.0×10^{-3}
CPC ion column fire	4.7×10^{-8} (1.6×10^{-8})	4.7×10^{-6}	8.7×10^{-10} (3.0×10^{-10})	8.7×10^{-8}	1.9×10^{-7} (6.6×10^{-8})	1.9×10^{-5}	1.0×10^{-3}
Pu oxide oven solids fire	1.2×10^{-14} (4.2×10^{-15})	1.1×10^{-12}	2.7×10^{-16} (9.4×10^{-17})	2.7×10^{-14}	2.8×10^{-14} (9.8×10^{-15})	2.8×10^{-12}	1.0×10^{-3}
Earthquake	3.0×10^{-12} (1.0×10^{-12})	3.0×10^{-8}	7.0×10^{-14} (2.4×10^{-14})	7.0×10^{-10}	7.2×10^{-12} (2.5×10^{-12})	7.2×10^{-8}	1.0×10^{-5}
Cs fire	2.6×10^{-10} (9.1×10^{-11})	2.6×10^{-5}	4.9×10^{-12} (1.7×10^{-12})	4.9×10^{-7}	1.1×10^{-9} (3.8×10^{-10})	1.1×10^{-4}	1.0×10^{-6}
Blender fire	4.7×10^{-11} (1.6×10^{-11})	4.7×10^{-6}	8.7×10^{-13} (2.3×10^{-14})	8.7×10^{-8}	2.0×10^{-10} (7.0×10^{-11})	2.0×10^{-5}	1.0×10^{-6}
Nuclear criticality in Pu oxide furnace	3.1×10^{-12} (1.1×10^{-12})	3.1×10^{-7}	6.5×10^{-14} (2.3×10^{-14})	6.5×10^{-9}	6.9×10^{-13} (2.4×10^{-13})	6.9×10^{-8}	1.0×10^{-6}
Expected risk[d]	4.8x10-8 (1.7x10-8)	–	8.9×10^{-10} (3.1×10^{-10})	–	2.0×10^{-7} (7.0×10^{-8})	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values. For the Preferred Alternative for analysis purposes approximately 30 percent of Pu was assumed for vitrification or immobilization technologies and the operational campaign would decrease. As a result, the impacts projected in this table for 50 t for the assumed 10-year campaign would be proportionately reduced for a 3.5-year campaign.

Source: Calculated using the source terms in Tables M.5.3.5.1–3 and M.5.3.5.1–4 and the MACCS computer code.

Table 4.3.4.1.9–6. Vitrification Alternative Accident Impacts at Idaho National Engineering Laboratory

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatalities[b]**	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
Blender spill	8.4×10^{-10} (2.9×10^{-10})	1.7×10^{-9}	8.6×10^{-12} (3.0×10^{-12})	1.7×10^{-11}	2.3×10^{-8} (8.0×10^{-9})	4.7×10^{-8}	0.05
Melter spill	8.4×10^{-13} (2.9×10^{-13})	8.4×10^{-11}	8.7×10^{-15} (3.0×10^{-15})	8.7×10^{-13}	2.3×10^{-11} (8.0×10^{-12})	2.3×10^{-9}	1.0×10^{-3}
Cs capsule drop	4.6×10^{-12} (1.6×10^{-12})	4.6×10^{-10}	3.8×10^{-14} (1.3×10^{-14})	3.8×10^{-12}	2.0×10^{-10} (7.0×10^{-11})	2.0×10^{-8}	1.0×10^{-3}
Canister drop	8.3×10^{-12} (2.9×10^{-12})	8.3×10^{-10}	8.5×10^{-14} (3.0×10^{-14})	8.5×10^{-12}	2.3×10^{-10} (8.0×10^{-11})	2.3×10^{-8}	1.0×10^{-3}
CPC ion column fire	6.1×10^{-8} (2.1×10^{-8})	6.1×10^{-6}	5.0×10^{-10} (1.7×10^{-10})	5.0×10^{-8}	2.6×10^{-6} (9.1×10^{-7})	2.6×10^{-4}	1.0×10^{-3}
Pu oxide oven solids fire	1.6×10^{-14} (5.6×10^{-15})	1.6×10^{-12}	1.7×10^{-16} (5.9×10^{-17})	1.7×10^{-14}	3.7×10^{-13} (1.3×10^{-13})	3.7×10^{-11}	1.0×10^{-3}
Earthquake	4.1×10^{-12} (1.4×10^{-12})	4.1×10^{-8}	4.4×10^{-14} (1.5×10^{-4})	4.4×10^{-10}	9.6×10^{-11} (3.3×10^{-11})	9.6×10^{-7}	1.0×10^{-5}
Cs fire	3.4×10^{-10} (1.2×10^{-10})	3.4×10^{-5}	2.9×10^{-12} (1.0×10^{-12})	2.9×10^{-7}	1.5×10^{-8} (5.2×10^{-9})	1.5×10^{-3}	1.0×10^{-6}
Blender fire	6.1×10^{-11} (2.1×10^{-11})	6.1×10^{-6}	5.1×10^{-13} (1.8×10^{-13})	5.1×10^{-8}	2.7×10^{-9} (9.4×10^{-10})	2.7×10^{-4}	1.0×10^{-6}
Nuclear criticality in Pu oxide furnace	4.0×10^{-12} (1.4×10^{-12})	4.0×10^{-7}	3.9×10^{-14} (1.4×10^{-14})	3.9×10^{-9}	9.0×10^{-12} (3.1×10^{-12})	9.0×10^{-7}	1.0×10^{-6}
Expected risk[d]	6.2×10^{-8} (2.2×10^{-8})	–	5.2×10^{-10} (1.8×10^{-10})	–	2.7×10^{-6} (9.4×10^{-7})	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values. For the Preferred Alternative for analysis purposes approximately 30 percent of Pu was assumed for vitrification or immobilization technologies and the operational campaign would decrease. As a result, the impacts projected in this table for 50 t for the assumed 10-year campaign would be proportionately reduced for a 3.5-year campaign.

Source: Calculated using the source terms in Tables M.5.3.5.1–3 and M.5.3.5.1–4 and the MACCS computer code.

Table 4.3.4.1.9–7. Vitrification Alternative Accident Impacts at Pantex Plant

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatalities[b]**	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
Blender spill	$3.7x10^{-10}$ ($1.3x10^{-10}$)	$7.5x10^{-10}$	$1.1x10^{-10}$ ($3.8x10^{-11}$)	$2.1x10^{-10}$	$2.5x10^{-8}$ ($8.7x10^{-9}$)	$5.0x10^{-8}$	0.05
Melter spill	$3.7x10^{-13}$ ($1.3x10^{-13}$)	$3.7x10^{-11}$	$1.0x10^{-13}$ ($3.5x10^{-14}$)	$1.0x10^{-11}$	$2.5x10^{-11}$ ($8.7x10^{-12}$)	$2.5x10^{-9}$	$1.0x10^{-3}$
Cs capsule drop	$2.2x10^{-12}$ ($7.7x10^{-13}$)	$2.2x10^{-10}$	$5.9x10^{-13}$ ($2.1x10^{-13}$)	$5.9x10^{-11}$	$1.9x10^{-10}$ ($6.6x10^{-11}$)	$1.9x10^{-8}$	$1.0x10^{-3}$
Canister drop	$3.7x10^{-12}$ ($1.3x10^{-12}$)	$3.7x10^{-10}$	$1.0x10^{-12}$ ($3.5x10^{-13}$)	$1.0x10^{-10}$	$2.5x10^{-10}$ ($8.7x10^{-11}$)	$2.5x10^{-8}$	$1.0x10^{-3}$
CPC ion column fire	$3.0x10^{-8}$ ($1.0x10^{-8}$)	$3.0x10^{-6}$	$7.7x10^{-9}$ ($2.7x10^{-9}$)	$7.7x10^{-7}$	$2.5x10^{-6}$ ($8.7x10^{-7}$)	$2.5x10^{-4}$	$1.0x10^{-3}$
Pu oxide oven solids fire	$6.9x10^{-15}$ ($2.4x10^{-15}$)	$6.9x10^{-13}$	$2.0x10^{-15}$ ($7.0x10^{-16}$)	$2.0x10^{-13}$	$4.2x10^{-13}$ ($1.5x10^{-13}$)	$4.2x10^{-11}$	$1.0x10^{-3}$
Earthquake	$1.8x10^{-12}$ ($6.3x10^{-13}$)	$1.8x10^{-8}$	$5.1x10^{-13}$ ($1.8x10^{-13}$)	$5.1x10^{-9}$	$1.1x10^{-10}$ ($3.8x10^{-11}$)	$1.1x10^{-6}$	$1.0x10^{-5}$
Cs fire	$1.7x10^{-10}$ ($5.9x10^{-11}$)	$1.7x10^{-5}$	$4.4x10^{-11}$ ($1.5x10^{-11}$)	$4.4x10^{-6}$	$1.4x10^{-8}$ ($4.9x10^{-9}$)	$1.4x10^{-3}$	$1.0x10^{-6}$
Blender fire	$3.0x10^{-11}$ ($1.0x10^{-11}$)	$3.0x10^{-6}$	$7.8x10^{-12}$ ($2.7x10^{-12}$)	$7.8x10^{-7}$	$2.5x10^{-9}$ ($8.7x10^{-10}$)	$2.5x10^{-4}$	$1.0x10^{-6}$
Nuclear criticality in Pu oxide furnace	$1.9x10^{-12}$ ($6.6x10^{-13}$)	$1.9x10^{-7}$	$7.0x10^{-13}$ ($2.4x10^{-13}$)	$7.0x10^{-8}$	$2.2x10^{-11}$ ($7.7x10^{-12}$)	$2.2x10^{-6}$	$1.0x10^{-6}$
Expected risk[d]	$3.0x10^{-8}$ ($1.0x10^{-8}$)	–	$7.9x10^{-9}$ ($7.8x10^{-9}$)	–	$2.6x10^{-6}$ ($9.1x10^{-7}$)	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values. For the Preferred Alternative for analysis purposes approximately 30 percent of Pu was assumed for vitrification or immobilization technologies and the operational campaign would decrease. As a result, the impacts projected in this table for 50 t for the assumed 10-year campaign would be proportionately reduced for a 3.5-year campaign.

Source: Calculated using the source terms in Tables M.5.3.5.1–3 and M.5.3.5.1–4 and the MACCS computer code.

Table 4.3.4.1.9–8. Vitrification Alternative Accident Impacts at Oak Ridge Reservation

Accident Description	Worker at 1,000 m: Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]	Worker at 1,000 m: Probability of Cancer Fatality[b]	Maximum Offsite Individual: Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]	Maximum Offsite Individual: Probability of Cancer Fatalities[b]	Population to 80 km: Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]	Population to 80 km: Probability of Cancer Fatalities[c]	Accident Frequency (per yr)
Blender spill	$8.5x10^{-10}$ ($3.0x10^{-10}$)	$1.7x10^{-9}$	$1.8x10^{-10}$ ($6.3x10^{-11}$)	$3.7x10^{-10}$	$1.8x10^{-7}$ ($6.3x10^{-8}$)	$3.5x10^{-7}$	0.05
Melter spill	$8.6x10^{-13}$ ($3.0x10^{-13}$)	$8.6x10^{-11}$	$1.8x10^{-13}$ ($6.3x10^{-14}$)	$1.8x10^{-11}$	$1.8x10^{-10}$ ($6.3x10^{-11}$)	$1.8x10^{-8}$	$1.0x10^{-3}$
Cs capsule drop	$5.2x10^{-12}$ ($1.8x10^{-12}$)	$5.2x10^{-10}$	$1.0x10^{-12}$ ($3.5x10^{-13}$)	$1.0x10^{-10}$	$1.3x10^{-9}$ ($4.5x10^{-10}$)	$1.3x10^{-7}$	$1.0x10^{-3}$
Canister drop	$8.4x10^{-12}$ ($2.9x10^{-12}$)	$8.4x10^{-10}$	$1.8x10^{-12}$ ($6.3x10^{-13}$)	$1.8x10^{-10}$	$1.7x10^{-9}$ ($5.9x10^{-10}$)	$1.7x10^{-7}$	$1.0x10^{-3}$
CPC ion column fire	$6.8x10^{-8}$ ($2.4x10^{-8}$)	$6.8x10^{-6}$	$1.4x10^{-8}$ ($4.9x10^{-9}$)	$1.4x10^{-6}$	$1.8x10^{-5}$ ($6.3x10^{-6}$)	$1.8x10^{-3}$	$1.0x10^{-3}$
Pu oxide oven solids fire	$1.6x10^{-14}$ ($5.6x10^{-15}$)	$1.6x10^{-12}$	$3.5x10^{-15}$ ($1.2x10^{-15}$)	$3.5x10^{-13}$	$3.0x10^{-12}$ ($1.0x10^{-12}$)	$3.0x10^{-10}$	$1.0x10^{-3}$
Earthquake	$4.1x10^{-12}$ ($1.4x10^{-12}$)	$4.1x10^{-8}$	$8.9x10^{-13}$ ($3.1x10^{-13}$)	$8.9x10^{-9}$	$7.7x10^{-10}$ ($2.7x10^{-10}$)	$7.7x10^{-6}$	$1.0x10^{-5}$
Cs fire	$3.8x10^{-10}$ ($1.3x10^{-11}$)	$3.8x10^{-5}$	$7.7x10^{-11}$ ($2.7x10^{-11}$)	$7.7x10^{-6}$	$9.9x10^{-8}$ ($3.5x10^{-8}$)	$9.9x10^{-3}$	$1.0x10^{-6}$
Blender fire	$6.8x10^{-11}$ ($2.4x10^{-11}$)	$6.8x10^{-6}$	$1.4x10^{-11}$ ($4.9x10^{-12}$)	$1.4x10^{-6}$	$1.8x10^{-8}$ ($6.3x10^{-9}$)	$1.8x10^{-3}$	$1.0x10^{-6}$
Nuclear criticality in Pu oxide furnace	$3.8x10^{-12}$ ($1.3x10^{-12}$)	$3.8x10^{-7}$	$8.5x10^{-13}$ ($3.0x10^{-13}$)	$8.5x10^{-8}$	$1.6x10^{-10}$ ($5.6x10^{-11}$)	$1.6x10^{-5}$	$1.0x10^{-6}$
Expected risk[d]	$6.9x10^{-8}$ ($2.4x10^{-8}$)	–	$1.4x10^{-8}$ ($4.9x10^{-9}$)	–	$1.8x10^{-5}$ ($6.3x10^{-6}$)	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values. For the Preferred Alternative for analysis purposes approximately 30 percent of Pu was assumed for vitrification or immobilization technologies and the operational campaign would decrease. As a result, the impacts projected in this table for 50 t for the assumed 10-year campaign would be proportionately reduced for a 3.5-year campaign.

Source: Calculated using the source terms in Tables M.5.3.5.1–3 and M.5.3.5.1–4 and the MACCS computer code.

Table 4.3.4.1.9–9. Vitrification Alternative Accident Impacts at Savannah River Site

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatalities[b]**	**Risk of Cancer Fatality per 10 yr (per 3.5 yr)[a]**	**Probability of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
Blender spill	$6.1x10^{-10}$ ($2.1x10^{-10}$)	$1.2x10^{-9}$	$1.5x10^{-13}$ ($5.2x10^{-14}$)	$2.9x10^{-11}$	$8.0x10^{-8}$ ($2.8x10^{-8}$)	$1.6x10^{-7}$	0.05
Melter spill	$6.1x10^{-13}$ ($2.1x10^{-13}$)	$6.1x10^{-11}$	$1.5x10^{-14}$ ($5.2x10^{-15}$)	$1.5x10^{-12}$	$8.0x10^{-11}$ ($2.8x10^{-11}$)	$8.0x10^{-9}$	$1.0x10^{-3}$
Cs capsule drop	$3.7x10^{-12}$ ($1.3x10^{-12}$)	$3.7x10^{-10}$	$8.2x10^{-14}$ ($2.9x10^{-14}$)	$8.2x10^{-12}$	$6.4x10^{-10}$ ($2.2x10^{-10}$)	$6.4x10^{-8}$	$1.0x10^{-3}$
Canister drop	$6.0x10^{-12}$ ($2.1x10^{-12}$)	$6.0x10^{-10}$	$1.4x10^{-13}$ ($4.9x10^{-14}$)	$1.4x10^{-11}$	$7.9x10^{-10}$ ($2.8x10^{-10}$)	$7.9x10^{-8}$	$1.0x10^{-3}$
CPC ion column fire	$4.8x10^{-8}$ ($1.7x10^{-8}$)	$4.8x10^{-6}$	$1.1x10^{-9}$ ($3.8x10^{-10}$)	$1.1x10^{-7}$	$8.4x10^{-6}$ ($2.9x10^{-6}$)	$8.4x10^{-4}$	$1.0x10^{-3}$
Pu oxide oven solids fire	$1.1x10^{-14}$ ($3.8x10^{-15}$)	$1.1x10^{-12}$	$2.7x10^{-16}$ ($9.4x10^{-17}$)	$2.7x10^{-14}$	$1.3x10^{-12}$ ($4.5x10^{-13}$)	$1.3x10^{-10}$	$1.0x10^{-3}$
Earthquake	$2.9x10^{-12}$ ($1.0x10^{-12}$)	$2.9x10^{-8}$	$7.1x10^{-14}$ ($2.5x10^{-14}$)	$7.1x10^{-10}$	$3.4x10^{-10}$ ($1.2x10^{-10}$)	$3.4x10^{-6}$	$1.0x10^{-5}$
Cs fire	$2.7x10^{-10}$ ($9.4x10^{-11}$)	$2.7x10^{-5}$	$6.1x10^{-12}$ ($2.1x10^{-12}$)	$6.1x10^{-7}$	$4.7x10^{-8}$ ($1.6x10^{-8}$)	$4.7x10^{-3}$	$1.0x10^{-6}$
Blender fire	$4.8x10^{-11}$ ($1.7x10^{-11}$)	$4.8x10^{-6}$	$1.1x10^{-12}$ ($3.8x10^{-13}$)	$1.1x10^{-7}$	$8.4x10^{-9}$ ($2.9x10^{-9}$)	$8.4x10^{-4}$	$1.0x10^{-6}$
Nuclear criticality in Pu oxide furnace	$2.8x10^{-12}$ ($9.8x10^{-13}$)	$2.8x10^{-7}$	$5.7x10^{-14}$ ($2.0x10^{-14}$)	$5.7x10^{-9}$	$4.7x10^{-11}$ ($1.6x10^{-11}$)	$4.7x10^{-6}$	$1.0x10^{-6}$
Expected risk[d]	$4.9x10^{-8}$ ($1.7x10^{-8}$)	– –	$1.1x10^{-9}$ ($3.8x10^{-10}$)	– –	$8.5x10^{-6}$ ($3.0x10^{-6}$)	– –	– –

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values. For the Preferred Alternative for analysis purposes approximately 30 percent of Pu was assumed for vitrification or immobilization technologies and the operational campaign would decrease. As a result, the impacts projected in this table for 50 t for the assumed 10-year campaign would be proportionately reduced for a 3.5-year campaign.

Source: Calculated using the source terms in Tables M.5.3.5.1–3 and M.5.3.5.1–4 and the MACCS computer code.

Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Tables 4.3.4.1.9–4 through 4.3.4.1.9–9.

The location of workstations, number of workers, personnel protective features, engineered safety features, and other design details that affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions, and criticality could cause fatalities to workers close to the accident. Prior to construction and operation of a new facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas to minimize the risk of injury or fatality in the event of an accident.

Aircraft Crash. The probability of an aircraft crash into a new disposition facility at Pantex will depend upon its specific location relative to the airport and airplane traffic patterns. In the future, there is the possibility that air traffic patterns may change and cause a change in the probability of a crash into a specific facility. [Text deleted.] A discussion of aircraft crash accidents for this PEIS is contained in Appendix R.

An indication of the magnitude of the impacts of an aircraft into a disposition facility is given by the earthquake scenario. The earthquake and aircraft crash scenarios are similar in that they both result in major structural damage and the release of Pu directly to the environment. They differ in that an earthquake-induced fire is based on limited combustible materials while the aircraft crash has the potential for a major fuel-related fire. Also, the earthquake has the potential for damage and release of hazardous materials throughout the facility while the aircraft crash may only damage and release hazardous materials in the vicinity of the point of impact. In both scenarios, the involved workers located within the facility could receive serious or fatal impacts.